New Jersey Agriculture

Vol. 27, No. 3 — *Published bi-monthly by Rutgers University* — May-June, 1945

College of Agriculture — Agricultural Experiment Station
New Brunswick, N. J.

FARM SCIENCE in WAR and PEACE

The Report of the New Jersey Agricultural Experiment Station for the Fiscal Year 1943-44

POULTRY

Legbar Breeding

The further development of the Legbar breed has featured the poultry breeding work during the year. A tentative breed standard has been worked out for this new kind of domestic fowl, including descriptions of plumage pattern, colors of feathers in the various sections (for its particolored plumage), size, and form. The 1944 matings were made on the basis of these tentative standard requirements; about 300 Legbar pullets, the 1944 crop, attest to advancement in the production of a more uniform type of fowl.

The breed still maintains the differentiating down-color by which the sexes of day-old chicks may be accurately determined by observation. The Legbar will breed true with respect to this autosexing characteristic, thus differing from first-generation cross-matings previously used for day-old sex-linked inheritance chicks.

It has been found that dark hens with distinct salmon breasts tend to produce highest percentages of dark-down chicks with distinctive striping. The trend is for these Legbar pullets and hens to produce nearly white-shelled eggs. Selection for a pure white shell will be continued.

The Legbars thus far bred have resembled the Leghorn in type and size. In further development of this breed, however, a larger size of fowl will be sought. The objective is to present a utility fowl, of pure breeding, which in addition to being an efficient producer of white-shelled eggs, quick-growing broilers, and high-quality meat, will possess the desired autosexing feature—combining all these attributes in a fowl of beauty and good lines.

Jersey Buff Turkeys

At the Turkey Research Farm, the fifth and sixth generation matings incident to the development of the Station's new, small-bodied, quick-maturing, broad-breasted, buff-colored turkey were made and studied. Cross-matings were made with excellent specimens of straight broad-breasted turkey stock from the Pacific Coast, in order to introduce more of this desired feature into the local strain. Material progress has been made; and the breeding season of 1944 indicates that the new breed, to be offered to eastern growers as one peculiarly well adapted to their type of turkey industry, is now advancing from the experimental to the commercial stage.

This new breed is to be called the Jersey Buff turkey. Trial shipments of hatching eggs and day-old poults were offered to New Jersey growers for field tests, at prevailing charges for such products, during the spring of 1944. More will be made available in 1945. About 100 breeder hens were used at Millville during this past spring.

Of special interest has been the project dealing with the production of "turkey broilers." These have been defined as young turkeys, at about 7 pounds live weight and about 12 weeks of age. Data on the cost of production will be studied, interpreted in terms of something like normal costs, and presented in bulletin form in the coming year. These young turkeys presented a remarkably well-meated carcass, dressed advantageously and easily, and were found, by several tests, to be succulent, extremely tender, juicy, and delicious. Like most young

Final Installment - -

With this issue we wind up the annual report of the New Jersey Agricultural Experiment Station. Put this together with Nos. 1 and 2 of the same volume and you have the report complete.

A limited edition of the complete report, printed in bulletin form, will be off the press within several weeks. If you want a copy, write us.

Pullets on Experimental Ranges at New Brunswick.

meats, these turkey broilers did not seem to possess a distinctive flavor which would resemble that of the mature fowl.

Turkey broilers might interest growers who (1) find it necessary to reduce the numbers of young stock on range or at hand during the midsummer period; (2) desire to present a delectable, different, and high-quality meat product to discriminating customers at a season when there is generally a dearth of quality poultry meat; and (3) wish to cater to a certain type of retail trade which might like this broiler particularly well and raise no objection to paying a reasonably high price for it.

Poultry Disease Work

Investigations relating to poultry diseases and parasites have continued to be a major line of work within the poultry department.

During the year ending June 30, 1944, the laboratories at New Brunswick and Vineland received a total of 13,945 specimens from 3,894 farms for diagnosis. This represents an increase of 157 cases and 1,066 autopsies over the previous year.

The lack of interest of the veterinary profession in poultry practice leaves the industry, in most places, without adequate protection. Consequently, the Station's diagnostic service is especially useful. The primary purpose of the diagnostic service, however, is to keep the Station in touch with current diseases and particularly to identify new parasites and infections as they appear. In the past, a deadly foreign disease (fowl plague) has appeared twice, and its early identification paved the way to prompt eradication. The first of these outbreaks involved several states, but the second was, fortunatelv, diagnosed early and the slaughter of affected and exposed birds eradicated the disease before it got beyond the county.

Thus the routine examinations indicate the diseases existing in the state and incidentally benefit the poultrymen who present them. In the same way that the Station draws from the publications of others, the reports on new diseases are of benefit to other pathologists who might encounter them. Moreover, the diagnoses serve as a basis for planning research projects.

Every year some new findings can be pointed to, and though many of these are of minor importance, the sum total of information over a period of years results in a valuable collection of data.

During the past year the findings of importance were: an outbreak of equine encephalomyelitis in pheasants in the absence of any reported cases in horses; pullorum infection in pheasants; tuberculosis in a pigeon; several types of *Salmonella* from various species of birds; *Tetrameres* sp. *and Cosmocephalus obselatus* from the proventriculus of a herring gull; a nematode, *Porrocaecum ensicaudatum,* and a fluke of the family *Dicrocoeliidae,* from the grackle; a skin fluke, *Collyriculum faba,* from a brown thrasher; two flukes *Cryptocotyle lingua* and *Himasthea quissetenosis,* from the intestines of herring gulls; a tick, *Ixodes brunneus* from a snow bird; two natural cases of malaria *(Plosmodium cathemerium)* in canaries; and finally, the observation that carbolineum causes poisoning in poultry.

A second project was mainly concerned with the study of laryngotracheitis. Two strains of this virus are propagated in embryonated eggs, one of recent isolation and another that has now been through 137 passages. A study of this latter strain will determine whether long passage through eggs affects the virulence of the virus or its immunizing properties, since it is known that some viruses become modified with continued propagation.

Thus, a strain of bronchitis virus has been carried in eggs for years and now after 160 generations has lost both virulence and immunizing properties for chickens while still exhibiting greater virulence for embryos than the sixtieth passage of the same virus passed less frequently.

In the same study there is a strain of fowl pox and pigeon pox and each is passed in hen and duck eggs. The object is to determine any modifying effect by passage in duck eggs. With pigeon virus passed in duck eggs a vaccine is made and has been used on two field flocks of turkeys and chickens with good results so far.

Two strains of canary pox are also carried in eggs, and vaccine made from these is supplied to a large canary breeder who, in turn, supplies immunized birds to laboratories investigating malaria.

Two as yet unidentified strains of virus are being carried and will be identified.

Wartme Poultry Feeding

Early in the year the poultry staff prepared a special bulletin on "Wartime Poultry Feeding," several thousands of copies of which were distributed throughout the state's poultry industry. Suggestions were offered as to substitutes which might be used in the event that usual foodstuffs became scarce or too high in price. Recommendations were included for improved feeding practices, and for ways and means of eliminating waste in poultry feeding. Copies of this bulletin are still available; and its contents will be most useful for the duration.

During the year, current poultry feeding problems have been studied from several angles. It has been found that restricting grain feeding to adult fowls to one hour daily, either from 8 to 9 a. m. or from 4 to 5 p. m., with the grain available in open hoppers, resulted in an increase in the ratio of mash to grain consumed without lowering total feed consumption, and with better egg yields in the pens where the grain feeding was restricted. This result is important, in view of the grain scarcity. It was found also that cooked soybeans could be fed to laying flocks in lieu of usual laying mash, in emergency, without fear of material drops in egg production.

Various grass mixtures have been tested for poultry ranges. There are indications that hens ranged on succulent grass crops or legumes could be carried over on mashes containing reduced amounts of usual proteins and vitamins — at least, as a war emergency measure. Likewise, mashes for pullets could safely be reduced, if the birds were ranged on green pastures. An interesting point was brought out in these range studies—the best crops for the

The new Jersey Buff Turkey, broad-breasted, quick-maturing and fine-flavored, is tailored to fit the needs of small families. This breed produces excellent broilers weighing about 7 pounds on the hoof at 12 weeks of age.

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hens usually looked the worst in the fields, because the hens kept those greens eaten down close. The greens accomplish results only if the fowls consume them while they are green, succulent, and full of juices.

Under an industrial fellowship project it was clearly demonstrated during the year that previous recommendations as to limestone requirements of laying fowls have been too low. Better yields and stronger shells (meaning much less breakage and loss) were obtained when pullet layers were allowed free access to soluble limestone grit and when as much as 7 per cent of limestone flour was added to the laying mash. These results will be presented in detail in a forthcoming bulletin.

Vitamin A Studies

A practical all-mash ration, containing between 1,000 and 1,200 units of vitamin A per pound, gave adequate growth with White Leghorn chicks. The vitamin A was supplied entirely as the plant forms, carotene and cryptoxanthin, and was furnished by 30 per cent of yellow corn meal and 1 per cent of alfalfa in the diet. As rather large variations were found in the vitamin A content of different samples of these ingredients, it is not possible to state that these levels of corn and alfalfa will always furnish enough of the vitamin.

Hens received an adequate amount of vitamin A from equal parts of mash, containing 30 per cent yellow corn meal and 4 per cent alfalfa, and scratch grains containing equal parts of cracked corn and wheat. Such rations were found to contain 2,000 to 4,000 units of vitamin A per pound of mash and 500 to 1,500 units per pound of scratch grains. Over a period of 8 months the average carotene content of the whole ration fell between 1,500 and 2,000 units per pound of feed.

The wartime shortage of fish liver oils as a source of vitamin A, the inadequate supply of yellow corn, and the scarcity and low quality of alfalfa have all directed attention to the possible necessity for other sources of this important vitamin for poultry feeding. Although extra labor would be necessary, it is within the realm of practicality to obtain supplementary vitamin A by the use of wheat or oat seedlings, grown in daylight from sprouted grains to a height of 4 to 6 inches. One pound of whole seedlings contains 4,000 to 6,000 International Units of provitamin A (carotene) and when fed at the rate of 5 pounds per hundred birds daily, approximately one-third of the daily recommended allowance will be satisfied. The use of chlorinated lime to control excessive mold formation during the growth of seedlings was not found harmful to laying birds.

Layers Will Stand Crowding

Because of a desire to carry a maximum number of layers in existing poultry houses, some poultrymen have raised the question as to whether or not the old rule of "4 square feet of floor area for every layer" might not be relaxed. Three flocks were carried through the winter, one with 4 square feet to a bird, one with 3 square feet, and one with only 2. All flocks were of the same line of breeding and of the same hatch. Production was essentially the same in each lot for the winter and spring seasons.

In the most crowded pen the litter was changed somewhat more frequently, as would be expected. These results will be presented in detail in bulletin form later; but it appears that poultrymen may safely allow one hen to each 3 square feet of floor area, and probably, if sufficient care in management is practiced, a rate of one fowl to each 2½ square feet of floor area can be used.

In this way poultrymen may be able to increase their layer holdings sufficiently to meet wartime and postwar needs for more layers without materially adding to existing structures. Management of flocks thus more intensively housed will be studied further. It is logical to assume that when an increased number of fowls is enclosed within a given floor area the daily care and management of those fowls may be increased, and even changed in form and amount.

Poultry Housing

As the war period advances and as studies are being made in postwar problems, poultrymen begin to ask about repairs and additions to poultry houses and about new types of poultry houses.

During the past year, field experiments based on two new ideas in poultry housing have been made at New Brunswick: one dealt with a house having a semi-round roof made of an asbestos board; and the second, with a field range shelter with a roof of the same asbestos material. The first structure, used in the form of a colony brooder house, or as a laying house for a flock of about 50 hens, has appeared to be advantageous in several respects: (1) Its form provides plenty of head room; (2) it can be easily set up through use of prefabricated sections: (3) it is neat and attractive in appearance; (4) it has considerable insulating value and needs no painting or other treatment. This type of building may be seen more and more in postwar farm poultry buildings. The second structure is providing good protection against the summer sun, and needs no painting.

Probably there will be a decided trend to standardize poultry house designs for the postwar period. The N. J. Multiple Unit Laying House idea, originated 30 years ago, may be a basic starting point in the evolution of the economical postwar chicken house.

The practicability of using masonry construction for poultry houses was proved last year in a 3-pen test house and feed room built in cooperation with a Somerset County farmer. Except for the roof, window and door frames, and interior fittings, the entire house is constructed of masonry units. A unique ventilation system admits air through vertical holes in the front wall blocks, discharging at window-sill level inside the house for uniform, draftless incoming air supply. Air is exhausted through the standard type of rafter ventilation system at the front of the low-pitched shed-type roof. The cinder blocks representing wall construction were treated inside and out with a brush coat of sand and cement mortar and finished with a neat wash coat of waterproof cement. Floors are of concrete. Dropping pits replace the usual dropping-board construction. Litter remained dry on the floor throughout the difficult winter season. With lumber scarce and high in price, poultrymen have shown a great deal of interest in the possibilities of masonry construction. This test house offers assurance that correctly designed poultry houses of masonry construction will give satisfactory performance.

Flock Mating Tests

In addition to the standard egg-laying tests the Station has instituted what has been called the "Flock Mating Project," operated in connection with the Passaic County test. The first project came to a close in September, 1943. Entries of pullets were restricted to chicks hatched from 100 eggs selected at random on the owner's premises, thereby representing a fairly good cross-section of the stock as bred and reared by the respective poultrymen. The winning pen of 16 pullets completed a year without any mortality. It was the only one of the 14 competing pens with that record.

Production for the year averaged 246 eggs per bird. The value of all eggs, sold at wholesale market prices, was $143. During the year the increased meat value of the birds in the pen amounted to $6, thus adding that amount to the gross income of the entry. After $40 was deducted for feed cost, the return was $109. On a comparable basis the return of the poorest pen was $25 and the average of all pens $79.

The widespread difference between the lowest and the highest pens is some measure of the great differences that exist on poultry farms and indicates the economic importance of the life of the fowl prior to the age of 6 months. After that age all birds in this project received the same feed, care, management, and the results obtained were due to conditions existing before the birds reached laying age.

New Slant on Culling

In an effort to reduce the amounts of poultry feeds needed, it has been the practice of some poultrymen to cull their laying flocks heavily, on a monthly basis.

Though removal of uneconomical layers is advisable, especially in these times, wholesale culling may result in the disposal of hens which would ultimately add materially to the nation's total food production through later egg yields. A study of the egg records of 736 pullets entered in the Hunterdon Egg-Laying Test during the year 1935-36 leads to the following conclusions:

1. Birds pausing (for 21 days) in egg production in the October-February period should not be culled because they laid at a profitable level for the rest of the year.
2. Birds pausing in egg production in the March-September period should be culled as detected.
3. Total egg production with no culling was 10,966 dozens, which gives a return over feed cost of $2,966.
4. Total egg production with monthly culling throughout the year would have been 7,719 dozens, with a return over feed cost of $2,345.

OTHER LIVESTOCK

An Extra Crop of Lambs

Though sheep production is not a large enterprise in New Jersey, it can be made a profitable side line on general farms because the eastern market will pay a premium for locally grown lambs of the right weight and finish. Many farmers feel, however, that the birth of only one lamb a year requires too much feed for such a small return. With this thought in mind it seemed desirable to determine the possibility of inducing estrum in ewes during the spring and to determine whether the ewes would conceive following this artificially induced estrum.

In the first trial, ten ewes, 3 and 4 years old, were injected with 5 cc. of gonadin. Six of the ten lambed the following fall. Twenty-five yearling ewes were also injected, and five of these lambed in the fall. The 11 ewes which had lambed in the fall bred normally the same fall and lambed again in the spring. These ewes after weaning their lambs were bred again in the fall of the second year, giving three crops of lambs in 2 years. This project has been enlarged this year in cooperation with the owner of a large commercial farm flock who has made about 100 ewes available for study under normal farm conditions.

Milk Production of Beef Cows

In beef production, the early gains are the cheapest, and the beef cattle producer is interested to know whether his brood cows are producing sufficient milk to raise a calf and also whether he can raise the level of milk production so as to get a larger calf at weaning time. With this in mind, an investigation has been started to be carried through a period of years to determine whether a thyroprotein compound included in the feed will increase the milk flow for the brood cow so that larger gains will be made by the calves during the nursing period.

Numerous experiments have demonstrated the ability of a thyroprotein to increase the level of milk and milk fat production in dairy cattle. Most of these experiments were of short duration, and it was desirable to determine whether thyroprotein could be fed safely over a long period of time.

One cow was fed thyroprotein for 16 consecutive months, and seven cows were fed thyroprotein from 3 to 8 months. No harmful influence was noted either during or following the prolonged feeding.

Nutritional Detective Work

Further confirmation has been obtained during the year of the value of an as yet unknown substance in meat scrap which is of value in the growth of nursling white rats. It is entirely possible that it is this substance which makes meat scrap, tankage, and fish meal so much desired in the rations of swine, and possibly also in poultry rations for good hatchability and growth of chicks.

OYSTERS

Oysters and the War Effort

Much emphasis is laid upon the contribution of the fisheries to the nation's food supply. And justly so, for here alone among our food resources does man reap where he has not sown, as he gathers in the finny fishes which migrate up and down our coastline. With shellfish we also gather of Nature's bounty hard and soft clams and scallops, putting nothing back into the water.

North of Chesapeake Bay he who gathers oysters must also sow. He plants his shells, gathers his seed, transplants his oysters to growing grounds and finally to fattening grounds to prepare them for market. He is in truth an underwater farmer. The annual oyster crop in this country approximates 90 million pounds of meats; meats returned to us from nutrients otherwise lost to the sea from the land. In this very important conservation harvest New Jersey now stands fourth among the states of the nation.

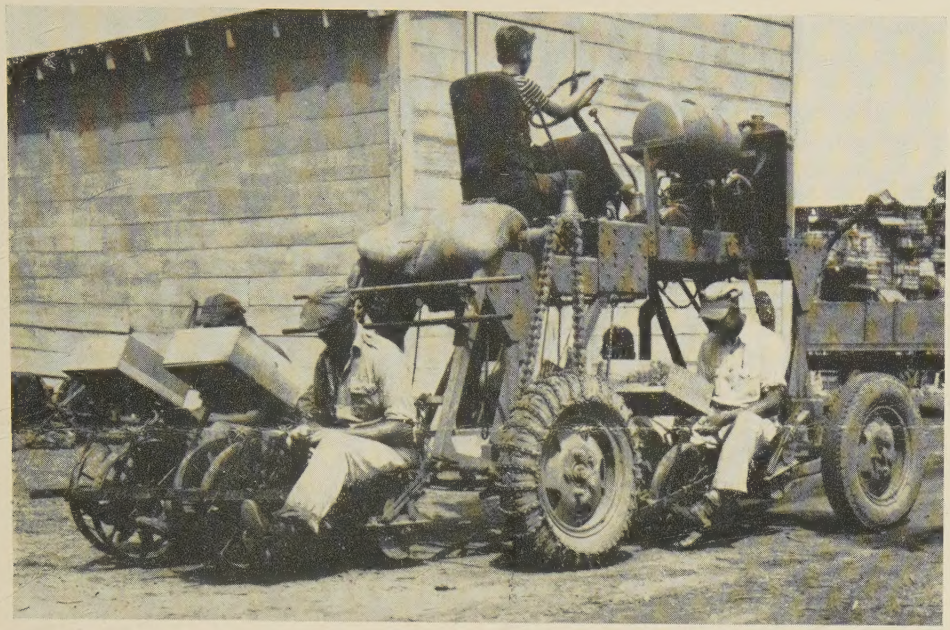
We consider the meats of the oyster and their contribution to the nation's food supply, while usually overlooking the valuable shells. These are planted back on the beds to secure a set of seed oysters, or are ground up and sold to poultry farmers as chicken grit. The value of oyster shells sold each year in this country is close to $1,500,000. We must therefore add the weight of shells to that of the oyster meats in computing the pounds produced each year. With this addition we find that oysters stand first among this nation's fisheries, exceeding even the huge annual salmon catch.

The importance of oyster shells to the poultry industry must be stressed at this time. The demand for chicken grit this year is so heavy that many a pile of oyster shells destined for planting upon oyster-producing bottoms has been ground up for poultry feeding. At Bivalve, one plant is rapidly reducing a pile of more than 300,000 bushels of shells to high-grade chicken grit. In normal times this pile of shells would have gone overboard. Oyster shells contain much more than the mere lime necessary for egg shells. Many other elements and compounds, such as iodine and phosphates, are present, at least some of which are important in maintaining the health, growth, and egg-laying capacity of the hen. The humble oyster, therefore, though unable to speak for itself, can justly claim some of the credit for this nation's record output of eggs.

"Fattening" Oysters for Market

The oyster stores its excess of food not as fat, as in most other animals, but as glycogen. Small amounts of oil obtained from certain food organisms also are stored, helping to give the oyster its distinctive flavor and raising its content of

Three hundred thousand bushels of oyster shells at a shell-grinding plant at Bivalve being turned into chicken grit. A contribution from the sea to the poultry industry. November, 1944.



An Essex County vegetable grower helped solve his farm labor problem by building this four-row transplanter.

vitamin A. Microscopic plants known as diatoms are of major importance in the nutrition of oysters. The shallow water tidal flats of the Cape May shores of Delaware Bay support an abundant diatom life. Oysters transplanted here show distinct improvement within a week. In a month's time oysters so poor as to be unmarketable can be so improved as to rank among the better stock in shell trade. In the summer of 1944 three shiploads of very poor oysters were brought to these flats where oyster food is unusually abundant. The experiment is being carried out as a cooperative project of an important oyster grower of the Maurice River Cove area and of the experiment Station's Oyster Research Laboratory. Preliminary results have been most promising, the oyster meats more than doubling in volume in one month.

Transplanting "Corn on the Cob" Set

The exceedingly dense sets of better than 600 oyster spat per square inch obtained each year on the Cape May shores of Delaware Bay have never been utilized commercially. Growth is so rapid and competition so keen that the oyster shells are paper thin. When these thin-shelled oysters are transplanted to deeper waters, crabs, drills and other enemies make short work of them. During the summer of 1943, shells were exposed to setting in wire bags, and the set moved to deep water when 2 weeks or less in age. In the new location much scaling off of young oysters occurred, and now after only one year a fine bed of rapidly growing, well-shaped oysters has developed. Some of the largest of these oysters are just under 3 inches long, a phenomenal growth for one year in northern waters.

By using this method of early transplanting, the wire bags are overboard for only 2 weeks and may be used year after year, thus amortizing the cost over an extended period. Each shell catches many times the set it would when on the bottom, thus greatly increasing efficiency. With competition for shells from our rapidly expanding poultry industry, fewer shells must be made to do the work of many. One of the largest planters in Maurice River Cove plans to plant up to 5,000 bushels of shells in bags during the summer of 1945.

MAN

ABOUT 76,000 farm workers are needed at the peak of the production and harvesting seasons in New Jersey. Of this number about 35,000 are on farms or in the neighborhood; another 30,000 are recruited from within the state, and 11,000 come from outside the state. On April 29, 1943, the President signed the Emergency Farm Labor Act, delegating to the Extension Service the job of labor placement on farms. Federal funds were thus made available to supplement a special state appropriation previously made to get a farm labor placement program under way.

A field staff was organized with headquarters at New Brunswick and with representatives in the various counties whose job it was to obtain labor and place it where the need was greatest. Three labor camps were set up in southern New Jersey to house about 2,000 Jamaican laborers. Business men, school boys, women, and girls were also pressed into service. A total of 5,881 farmers placed 15,785 orders for farm help during that first season. The records show that 4,651 farmers, or 79 per cent of those requesting help, received it, and that 14,420, or 91 per cent, of the orders were filled.

Congress extended the program on substantially the same basis for 1944, with indications that the need would be as great as in 1943.

Wartime Responsibilities

Many other emergency administrative duties have devolved upon county agents and extension specialists to add to the pressure under which they are striving to assist farmers in the production of record quantities of food despite scarcities of labor and machinery, gasoline and rubber, equipment and supplies.

In each agricultural county, rationing committees have been established under the County Agricultural War Boards. In most counties, the agricultural agents were called upon to assist in organizing these committees and, in many cases, to serve as their secretaries. One such committee in each county is in charge of farm machinery rationing. Some 20,000 applications for farm machinery were acted upon by these committees during the year. A transportation committee in each county is charged with the allocation of farm trucks and tires and extra gasoline. Approximately 215 truck applications were approved last year. A farm building committee in each county receives farmers' applications for lumber, hardware, electrical equipment and other restricted materials in connection with all major repairs to farm houses or buildings. More than 400 building applications came before these committees during the year.

Farm Building Services

Despite building restrictions, the demand on the Extension Service for farm building plans and advisory service continued heavy. Among the 924 blueprint plans for farm structures distributed during the year, nearly 500 were related to poultry farming, 140 represented dairy barn plans, and the remainder represented hog and horse barns, cribs, and crop and implement storage structures. Personal assistance was given to 35 dairy farmers in planning new barns or remodelling old ones; 59 poultrymen received special help in connection with their construction problems; and 37 farm calls were made to advise on fruit and vegetable storage plans and construction. In many cases, such assistance has resulted in appreciable savings in construction costs over original intentions.

Testing Paints

Five years ago a fence was erected at New Brunswick with direct southern exposure for the purpose of solving a variety of paint problems of particular interest to farmers. The project was undertaken in cooperation with the Cornell Experiment Station and the G-L-F Exchange. The various panels have been subjected to periodic inspection through the 5-year period.

Among the findings at this stage, it appears that the kind of wood may be an important factor in paint failure. Some paints failed much sooner on pine than they did on cedar; other paints, particularly the barn reds, did about as well on pine as on cedar.

Substitution of soybean oil for a portion of the linseed oil was also tried out, since at the time the test was started there was a trend in this direction. It appears that up to 25 per cent by weight of the linseed oil in white paint can be replaced by soybean oil without affecting performance unfavorably. The barn red tests are not yet complete, but indications are that an even higher proportion of soybean oil can be used satisfactorily in these paints.

Victory Gardens

The fall of 1943 saw an intensive Victory Garden program carried to a successful conclusion, with vast quantities of home-produced food in the larders of New Jersey families, both rural and urban. For 1944, the nation called for a 25 per cent increase in garden production, to be obtained by increasing the number, size, and efficiency of home gardens.

As in the previous season, the Experiment Station, College of Agriculture, and Extension Service were called upon to administer the educational phases of the effort. Meetings, community short courses, press, radio, and instructional literature were utilized, as in the previous year.

Early in the season it became apparent that the demand for our services would not be so heavy as in 1943. This was due partly to the fact that the major educational job had been done the year before. Then too, there was not the same incentive as in 1943 because of the removal of commercially canned vegetables from the ration lists in the early winter. Early surveys indicated that there might be an increase in Victory Gardens, but final reports showed that there were 10 to 15 per cent fewer gardens, although it was reported that many who had gardens in 1943 had larger gardens in 1944. Comments from several sources are to the effect that the general level of skill in gardening was higher in 1944 than last year.

Nevertheless, there can be no question that New Jersey did not meet the requested 25 per cent increase in production. A deficiency in soil moisture carried over from late 1943 was not fully overcome by spring rains, and a severe midseason drought affected virtually every section of the state, causing serious reduction in normal yields wherever artificial watering could not be employed.

Another reflection of the wartime food situation was a marked increase in correspondence concerning the cutting and curing of various types of meat. This may be attributed in part to the increase in the number of local freezing plants in the state and in part to more home processing of animals raised on the farm.

Looking ahead, it seems clear that the educational task has been largely accomplished for the duration, and that the work of the institution with home gardeners can be restored to a service basis, to be handled in the main by the continued distribution of literature. Many persons have doubtless gained a new appreciation of working with plants, and it is to be expected that in years to come New Jersey homes will be more beautiful, both outdoors and in, as this war-born interest in gardening is diverted from food to flowers and shrubs.

Fruit Processing

Both home and commercial canners are keenly interested in turning out a product that will be attractive to eye and palate. Recent studies have shown that there is a marked difference among varieties of fruits and vegetables in their adaptation to canning and other methods of processing. This becomes a matter of interest to the farmer as well as the processor and consumer, since it tends to affect the marketability of his products.

Investigations of this subject have therefore been initiated in the Station laboratories. About 700 samples of fruit representing a large number of varieties were processed experimentally during the year by quick-freezing and various methods of heat processing.

The Garden State nectarine, a New Jersey introduction, proved to be especially well adapted to freezing. Flavor and appearance were both improved if the nectarines were frozen in halves with the skin on. When they were canned with the skin on, however, the red pigment faded, and the product was not so attractive as when the fruit was peeled. The following New Jersey peach varieties proved to be especially well adapted to quick-freezing: Eclipse, Goldeneast, Pacemaker, Sunhigh, and Triogem.

The use of the correct amount of sugar was found to be especially important in bringing out the best peach flavor. A rather undesirable strawy taste was evident in both canned and frozen peaches when the sugar content was slightly below optimum. With most varieties a 40 per cent sirup was sufficient to prevent this undesirable flavor, although with other varieties at least a 50 per cent sirup was desirable. A few low-acid seedling varieties gave a fairly satisfactory canned product without any sugar. This particular type of peach is of special interest to persons who can take very little sugar in their diet.

The browning of the fruit after it thaws is one of the most important problems in connection with quick-freezing of peaches. The ideal solution would be varieties that do not turn brown on exposure to the air. Fruit of one peach seedling, as yet unnamed, was still of bright color, with no undesirable browning, after having been thawed and exposed to the air overnight. Various methods to prevent browning were studied. Slicing the peaches directly into cold sirup and keeping them covered with sirup after thawing until they are served is a simple and useful method, although it will not completely prevent browning very long after the fruit thaws.

Blueberries and blackberries made a very satisfactory frozen product. Blueberries covered with a 30 per cent sirup had better texture and flavor than those frozen with dry sugar or no sugar at all. Blackberries, after having been frozen with 50 per cent sirup, and then thawed, were found to have lost much of their tart, bitter taste and were, in the opinion of several observers, more desirable than the fresh fruit.

The importance of the proper degree of maturity for canning peaches was well demonstrated. Elberta peaches picked when they were hard ripe were inferior in flavor and appearance to those which were tree-ripened. Fruit which was so ripe that it dropped normally, although delicious for eating out of hand, was not so good canned as was tree-ripened fruit picked directly from the tree.

HEALTH

An important, and growing, place in the Station's program is occupied by activities related in one way or another to the safeguarding of human health. Mosquito control, sewage treatment, and water supply problems have been under study in our laboratories for many years. More recently, the microbiologists have been drawn into this field.

Mosquitoes

New Jersey, one of the first states in the country to undertake mosquito control work on an extensive scale, began its program more than 40 years ago because the citizens demanded relief from the great pest which made it virtually impossible to stay out-of-doors during the summer months, and which was preventing the development of many natural advantages of the state. Throughout the new densely populated residential districts of northeastern New Jersey mosquitoes were then so numerous as to discourage prospective home owners from building in otherwise highly desirable locations; in the metropolitan section industries were subject to interference resulting from attack upon their personnel by hordes of mosquitoes; in many farming districts labor and animals alike suffered annoyance by the pest; and on the seashore, there were few places where it was possible for resort developments to make normal progress.

Twelve counties formerly subject to the annoyance produced by hordes of mosquitoes are now engaged in a unified

mosquito control program, coordinated by the Experiment Station. These comprise Sussex, Morris, Passaic, Bergen, Hudson, Essex, Union, Middlesex, Monmouth, Ocean, Atlantic, and Cape May. It is estimated that the reduction of mosquito breeding on the salt marsh areas alone has allowed the adjacent industrial, residential, and shore resort property to increase in taxable values $555,000,000 more than could have been expected if the mosquitoes had been left uncontrolled. Realizing the benefits that have accrued to these counties, one additional county has recently begun some antimosquito work, and another is now considering the adoption of a control program.

The Experiment Station has always encouraged the utilization of permanent methods of mosquito control, including filling, ditching, diking, and tide-gating and the use of efficient machinery for the performance of routine operations. Accordingly, although war shortages of experienced labor now make it more difficult to keep the work on a normal schedule, the operation of the permanent works, supplemented by the use of machines and such hand labor as can be obtained for temporary control by spraying, has yielded good results.

Measuring Mosquito Abundance

Mechanical traps developed by the Experiment Station for standardized mosquito survey and measurement purposes are operated nightly over the state. Forty-one traps operated in 1943 show that there were only one fifth as many mosquitoes on the wing where mosquito control work is being done as in the areas without mosquito control. Thirty-two traps in the protected zone caught an average of 19.5 mosquitoes per trap nightly, while 9 traps in unprotected sections caught an average of 94.3.

Though the mosquito work of New Jersey has been directed against pest mosquitoes generally, it has brought about a vast reduction in the numbers of *Anopheles quadrimaculatus,* the one New Jersey species which can transmit malaria.

Larvicides and Repellents

Oil is the most widely used mosquito larvicide, but in some places it is objectionable, and other larvicides must be used. The Station had perfected an effective material for use in such places, but this involved the use of pyrethrum, now no longer available to civilian agencies because of the military demands which must be met from the limited supplies available. The Station has now developed a substitute material which is available in concentrated form under the designation "New Jersey Mosquito Larvicide #2." It has certain advantages similar to those of the pyrethrum larvicide: (1) the amount of material which must be transported is reduced to one tenth of the amount of oil which would be needed; (2) fire hazard is avoided; (3) injury to vegetation is reduced.

During the past year the Station has continued its research work aimed toward the development and improvement of insect repellents for the armed forces. Cooperative efforts with various government agencies have been expanded to include a research investigation requested by one of the interested agencies. This latter project is aimed toward the treatment of soldiers' clothes to prevent biting through of disease-bearing or pest insects.

Use of repellents to prevent transmission of disease by insects, particularly malaria-carrying mosquitoes, has become an accepted practice wherever the army is exposed to such danger. With the advance and expansion of our forces in localities where such insects abound, research and developmental work on insect repellents assumes increased importance.

Sewage Filter Studies

Purification of sewage on trickling filters has been practiced for many years, and these low-rate filters are considered standard. During the last few years a new type of high-rate filter has come into use. The first of this kind of filter in the state was built at a large army camp. This gave the Station the opportunity to study the relative efficiency and mechanisms of purification of both types of filters. A study lasting over a year has shown certain differences. In general, the low-rate filters produce a higher degree of purification than high-rate filters. The degree of stabilization is higher in low-rate filters, but the quantities of sewage treated are materially less. Reduction of *B. coli* is about 80 per cent in the high-rate filter and about 97 per cent in the low-rate filter. Destruction of organic matter, including grease, is greater in the high-rate filter.

Laundry Wastes

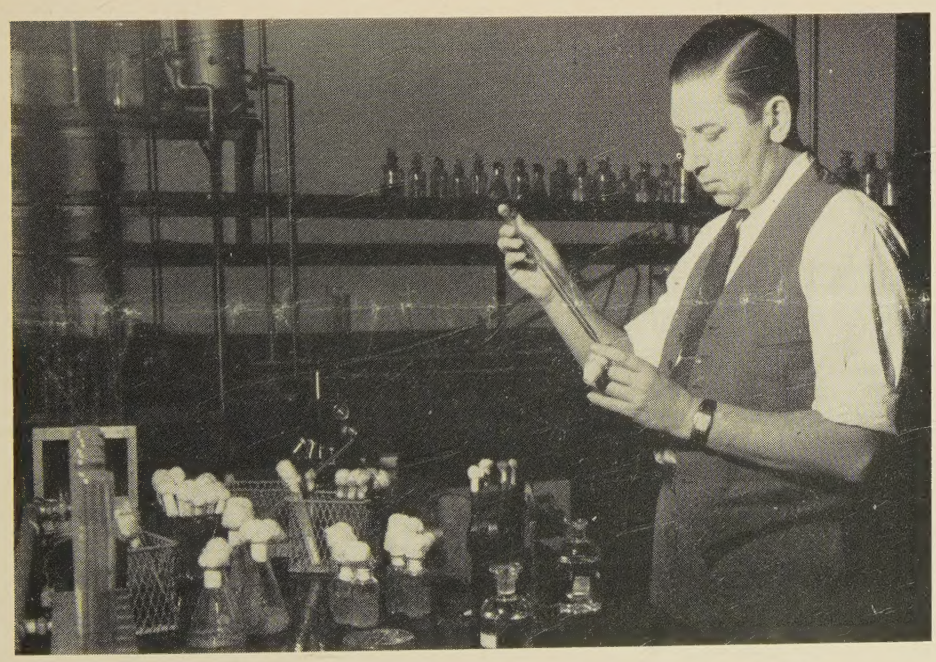
One of the most common wastes present in sewage comes from laundries. Municipal sewage plants must handle it, and plants serving institutions and commercial laundries often receive large quantities throughout the entire week. To determine the most economical method of handling and treating the waste, information available was collected and experimental work conducted showing that various procedures or combinations can be followed. In general, if pretreatment is necessary, best results can be obtained at the municipal or institutional sewage plants where personnel familiar with and equipment suitable for such treatment are available. Laundry wastes alone can be treated economically to any desired degree of purification.

Use of Lime in Sewage Treatment

A study made of the properties, structure, size, solubility, and other characteristics of hydrated lime showed that lime in solution is better for reaction control in digesters and for sewage clarification than lime slurries or dry lime. Using part of the sewage to make the solution has been recommended for operation. For equal clarification and removal of oxygen-demanding materials, lime in solution is lower in cost than any other coagulant or combination of coagulants.

Nitrates in Streams

Nitrates are found in clean and polluted streams. Previous attempts to correlate the quantities of nitrates found in surface waters with the degree of pollution have



Running purity tests on drinking water in the New Jersey Agricultural Experiment Station laboratories.

failed. Results obtained on polluted streams over a period of years now show that the quantities of nitrates present are not dependent upon the degree of pollution, that the temperature of the water is of minor importance, that the quantities of nitrates are materially higher in winter than in summer, and that the quantities of nitrates can be correlated with the volume of water in the stream. During and after rains, the amounts of nitrates increase. The character of the drainage area affects the amounts of nitrates increase. The charter of the drainage area affects the amounts of nitrates present.

Antibiotic Substances

The ability of various groups of microorganisms, largely occurring in the soil, to inhibit the growth of and to destroy disease-producing bacteria has excited great interest during the last two or three years on the part of manufacturers of drugs and chemicals, as well as on the part of public health and medical authorities. This interest has been chiefly due to the fact that two important chemical agents, gramicidin and penicillin, have been isolated from two typical groups of soil organisms and have been utilized for the control of various diseases in man and in animals.

Six other compounds, with similar properties, have been isolated in the Station's microbiology laboratories. These are actinomycin, clavacin, fumigacin, streptothricin, streptomycin, and chaetomin. Of these six compounds, the first two proved to be extremely toxic and, therefore, were found to offer little promise as chemotherapeutic agents. Two of the above compounds, streptothricin and streptomycin, both of which are produced by soil actinomycetes, were found to offer distinct promise for the treatment of various human and animal diseases. These two substances are of particular importance, because they act upon a variety of gram-negative bacteria not affected by any other known substances and also because they possess only limited toxicity to animals.

Since gramicidin and penicillin act largely upon gram-positive bacteria, the ability of streptothricin and streptomycin to attack such organisms as *Shigella dysenteriae,* the cause of human dysentery, *Eberthella typhosa*, the cause of typhoid fever; *Proteus vulgaris* and *Pseudomonas aeruginosa,* causing serious wound *infections*; *Salmonella schöttmulleri,* the cause of certain types of food poisoning; *Shigella gallinarum,* the cause of fowl typhoid; *Brucello abortus,* the cause of abortion in cattle; *Pasteurella tularensis,* the cause of tularemio; *Mycoliae terium tuberculosis,* the cause of tuberculosis, and many other groups of gram-negative bacteria causing important human and animal diseases, is of great theoretical and practical significance. A number of industrial organizations are now engaged in an effort to produce these two substances on a large enough scale so that they can be used not only for the treatment of experimental animals, but also clinically in the treatment of certain human infections. Various medical institutes and governmental laboratories are engaged in testing the activity of streptomycin and streptothricin in the human and in the animal body.

Bacterial Corrosion of Iron

As reported last year, a special group of bacteria is responsible for destruction of steel and cast iron in certain soils. This type of corrosion is commonly encountered in wet land where the ground water stagnates. It is most common in heavy soils, but it may also be encountered in sandy soils, provided conditions are strongly reducing. Unlike rusting, the metal does not become coated with red or brown iron oxides, but there appears a black coating of iron sulfide which may be in the form of a scale or a soft graphite-like material. The soil is also generally mottled and shows areas of blackening.

Investigations carried on during the past 12 months have indicated that anaerobic iron corrosion is widespread. It may be responsible for destruction of both steel and cast iron, and all kinds of iron structures buried in soil are susceptible to attack, particularly pipe lines which are buried considerably below the soil surface. Most severe corrosion is commonly encountered in regions where there is evidence of decomposition of organic matter in the soil about the corroding iron. Recent results, however, indicate that although corrosion is accelerated where plant materials are undergoing decomposition, the bacteria responsible for corrosion are able to grow on the products coming from the iron itself even though there is no organic material to serve as a source of food for these bacteria. Consequently, this type of corrosion may be encountered over widespread areas, provided conditions are strongly reducing in the soil and the soil reaction is close to neutrality.

As information on these bacteria accumulates, it becomes increasingly clear that they are far more important agents of corrosion than has hitherto been realized. Not only do they attack the exterior of pipes, but they can also corrode the inside in cases where the metal surface is protected from oxygen contained in the water by rust or other deposits on the metal surface.

Fat from Yeast

During the course of studies of soil microorganisms, an interesting organism was obtained which produces large amounts of fat and has possibilities of being used for commercial fat production. The organism, which is widely distributed in soils, is a yeast with many unusual characteristics and, so far as has been determined, is unlike any of the numerous yeasts previously described. When grown under suitable conditions, each yeast cell is almost entirely filled with a large single fat globule. The fat is not extracted directly by fat solvents, but is readily extracted after the yeast is treated with dilute acid.

Under favorable conditions, 20 per cent or more of the carbohydrate consumed by the yeast is converted into yeast cells. These cells contain from 55 to more than 60 per cent fat. Thus the efficiency of conversion of carbohydrate to fat is between 10 and 15 per cent. Greatest fat production occurs when the yeast is grown on media containing small amounts of nitrogen. The yeast is remarkable in that there are few if any other microorganisms which are able to produce such a high fat content.

New Jersey Agriculture

PUBLISHED BI-MONTHLY BY THE

Agricultural Experiment Station and the College of Agriculture, RUTGERS UNIVERSITY.

Editorial Board: W. H. MARTIN, Dean and Director; F. G. HELYAR, Director of Resident Instruction; L. G. COOK, Associate Director of Extension.

"Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917." Entered as second-class matter, February 1, 1919, at the Post-Office, at New Brunswick, N. J., under the Act of August 24, 1912. Application for re-entry as bi-monthly granted January 9, 1933.